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Conserving What? — The basis for nature conservation reserves in New South Wales 1967–1989

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INTRODUCTION

With the establishment of the National Parks and Wildlife Service in New South Wales in 1967 a major programme commenced to establish a comprehensive reserve system for nature conservation as well as other purposes. As at 30 June, 1988 this system consisted of 68 National Parks, 185 Nature Reserves, 22 State Recreation Areas, 13 Historic Sites and nine Aboriginal Areas covering 3.7 million hectares or about 4.62% of the land area of New South Wales (NPWS 1988). Much of the conservation biology literature which examines the principles of reserve design (e.g., Soule and Wilcox 1980; Soule 1986; Simberloff 1986) focuses on the operational principles in designing reserve boundaries and size without canvassing the threshold question of exactly what is it that we seek to conserve in their establishment. All too often the absence of debate on the range of options and choices in defining the underlying philosophy of what we are seeking to conserve in nature reserves obscures the significant implications of the choices involved and makes subsequent consideration of the principles of reserve design complex and inconclusive. This paper seeks to raise debate on the underlying basis of nature reserve establishment programmes by examining the experience of the New South Wales National Parks and Wildlife Service from 1967 until 1989, by posing the range of options available as driving forces for a nature conservation programme and by highlighting the significantly different priorities which emerge from these options.

HISTORICAL PERSPECTIVE

The National Parks and Wildlife Service was established as an organization in November 1967. Its staff were an amalgam of the Parks and Reserves Branch of the Lands Department and the Fauna Protection Panel of the Chief Secretary's Department. The organization was modelled very much on the United States National Parks Service even to the extent that the first Director, Samuel P. Weems was imported from the United States Service (Pettigrew and Lyons 1979). Yet paradoxically although the external symbols of nomenclature, uniform and language are similar and the founding intent of Tom Lewis as Minister for Lands and founder of the Service was to replicate the United States Parks Service in New South Wales, the two organizations are more divergent than is readily appreciated.

Part of this divergence is a product of history. Both nations share an antiquity in national park establishment. Yellowstone, the world's first National Park was established in 1872 (Bartlett 1985). The Royal National Park on the southern outskirts of Sydney was the world's second national park established in 1879, although it did not gain its regal appellation until graced by Queen Elizabeth II in 1954, prior to which it was just "The National Park" (Pettigrew and Lyons 1979).

Park establishment proceeded apace in both nations with Ku-ring-gai Chase National Park on Sydney's north established in 1894 (Goldstein 1979). But as an organization the United States National Parks Service was

established in 1916 some 51 years prior to the establishment of the National Parks and Wildlife Service in New South Wales. Thus the United States had a half century lead on Australia in the development of a corporate, integrated and professional approach to national park management. Parts of the impetus for the establishment of the United States National Parks Service rests on most dubious grounds — the struggle for the mastery of Europe in the First World War and Woodrow Wilson's desire for American intervention. For prior to the War, United States Army Troops occupied Yellowstone — they were its staff and its rangers, there to protect visitors and wildlife alike. The need for soldiers to fuel the bloody battlefields of France and Flanders, resulted in the withdrawal of troops from Yellowstone, and the establishment of the ranger force (Bartlett 1985).

The fact that the United States Parks Service predates the New South Wales Service by 51 years is not merely a testament to the organizational longevity of the American parks organization. What matters is that both organizations were established in widely differing philosophical and cultural milieus.

In the early part of the twentieth century in a newly wealthy America, resplendent in its economic strength and newly found status as a world power, recreation and leisure pursuits dominated park administration. Providing visitor services was unquestionably the major thrust for the United States National Parks Service. Conservation in its scientific sense was very much a post World War II phenomenon (Foresta 1984).

And we must remember that at this time the discipline of ecology was in its formative stages. The one area where conservation was important for the early American park managers was wildlife protection. Wildlife management had as its rationale the protection of the sport of hunting and the provision of picturesque scenery for park visitors (Fox 1981).

Americans have a wildlife which is larger and less cryptic than Australia's and hence easier to shoot; more ferocious in appearance and hence more desirable to mount as trophies; and, for those with a culinary inclination, tastier to the palate and hence better to eat. It is curious to reflect that much of our scientific knowledge regarding techniques for managing wildlife populations arose from the management of species which were prized by hunters (Fox 1981).

Australia, while lacking a tradition of game hunting, embraced at the same time as the Americans the ideology of parks as the province for recreation and of park managers as the providers of visitor services. But whereas in America that ideology penetrated and captured the Parks Service, in New South Wales it received

no such corporate endorsement in the absence of a central parks service (Goldstein 1979). Instead it was quarantined in the park trusts, philanthropic groups of citizens who ran individual parks in New South Wales prior to the National Parks and Wildlife Service, and in the creaking labyrinths of the Lands Department. The establishment of the National Parks and Wildlife Service in 1967 was a result of the upswing in general community interest in environmental issues as opposed to the previous more limited and localized interests in natural history, and with the growing scientific discipline of ecology. This framed the intellectual milieu in which the new organization grew and developed and ensured a greater priority to the scientific bases for conservation (Worster 1977).

This is well reflected by the establishment in 1968 of the Scientific Committee on Parks and Reserves to advise the Minister for Lands on requirements for a parks system (Goldstein 1979). Prior to the establishment of the Scientific Committee a number of parks were established in New South Wales — Kosciusko in 1944 and in the following two decades parks such as New England, Gibraltar Range, Dorrigo and Bouddi. Two factors characterized each of these park establishments:

- First, the motives for their establishment were localized and not based upon a consistent philosophy of nature conservation in a State wide or national context.
- Second, they were often the product of dynamic and committed individuals — Marie Byles in the case of Bouddi, Sir William McKell in the case of Kosciusko, the Wright family in the case of New England.

Often the reasons for park establishment were based upon rationales of local natural history, local scenery, protection of productive resources or the promotion of local tourism. This suite of reasons underlay moves in the Hunter region to establish a park in the Barrington in the 1950s (Adam 1987). Occasionally the reasons are more bizarre. The Gibraltar Range National Park west of Grafton and immediately adjacent to the newly established Washpool National Park is a case in point. It owes its existence to the Department of Main Roads which in the 1960s carved the route of the Gwydir Highway from Grafton to Glen Innes and suggested that given the presence of the new highway a National Park should be established around it for the benefit of the new road's users. By a curious twist of fate, the Gibraltar Range National Park has now joined a number of other rain-forest parks in New South Wales on the World Heritage List (Adam 1987).

The Scientific Committee of Parks and Reserves

The Minister who established the National Parks and Wildlife Service, Tom Lewis, also established the Scientific Committee on Parks and Reserves in 1967. Its task was to advise the Minister on "the optimum sample of the various ecosystems throughout the State which should be reserved for scientific purposes from those lands still essentially in the natural state, or capable of being restored to something approximating the natural state" (McMichael 1973). The Scientific Committee consisted of the prominent botanists, ecologists and wildlife scientists within government, academe, the CSIRO, a representative of the Australian Conservation Foundation plus the Director of the National Parks and Wildlife Service *ex-officio* and was chaired by Dr F. H. Talbot. The Scientific Committee undertook its work with vigour and in the space of a few years had completed an overview of the state and recommended the basis of a system of parks and reserves (Scientific Committee on Parks and Reserves, 1968, 1969, 1971a, 1971b, 1971c).

The approach of the Scientific Committee was briefly outlined in the introductions to its second and third reports (Scientific Committee on Parks and Reserves 1969, 1971a). The Scientific Committee stated that: "It is clearly important that as much diversity as possible of Australian animals and plants be retained for human use... Although some species of plants and animals may be retained in zoos and gardens the complex natural systems within which they normally exist contain more information than the isolated species themselves... The Committee has, therefore, utilized an ecosystem approach rather than concern itself with individual rare species" (Scientific Committee on Parks and Reserves 1969). However, the ecosystem concept utilized by the Scientific Committee was not explicitly defined; indeed the Scientific Committee recognized that itself in its coastal survey where it utilized a more detailed subdivision of the survey area into ecosystems than it did in its survey of the Tablelands (Scientific Committee on Parks and Reserves 1971a).

The work of the Scientific Committee, although in retrospect appearing coarse and intuitive, stood the test of time providing the directions for acquisition and reserve establishment in the decades ahead.

The International Biological Programme Survey: The Specht Report

On a national scale the scientific interest in nature conservation produced a hallmark achievement. This occurred under the aegis of the Australian Academy of Science. It was the work of the Sub-committee for Conservation of Terrestrial Communities of the National Committee for the International Biological Programme

under Professor R. Specht. Between 1964 and 1974 it undertook a comprehensive survey of ecological reserves throughout Australia (Specht, Roe and Broughton 1974), the results of which were published in 1974 under the title "Conservation of Major Plant Communities in Australia and Papua New Guinea" (Specht, Roe and Broughton 1974). The International Biological Programme conservation survey aimed to show a way in which a national system of reserves, conserving the greatest variety of plants and animals, can be achieved in the shortest period of time. The International Biological Programme survey decided that a rational conservation network should be based on major ecosystems (interaction of the living and physical environment). For convenience, the survey then proceeded to substitute major plant communities for major ecosystems on the basis that most animals depend on particular plant communities and that plant communities are relatively better known.

The International Biological Programme Survey used the concept of the alliance as its classificatory level and selected approximately 900 alliances as the major plant communities which should be conserved in Australia. Next the existing parks and reserves in each state were examined to assess the plant communities present therein to arrive at assessment of the conservation status of each major plant community.

The result was an invaluable overview, sweeping in scale and of great significance in directing efforts in the establishment of new reserves. But its very scale posed problems. In view of the controversy over rainforest conservation in New South Wales between 1976 and 1982 it is fascinating to note that the Specht survey identified nine rainforest alliances of which six had a conservation status of excellent, including subtropical rainforest, warm temperate rainforest and cool temperate rainforest. Certainly this highlights the fact that assessments of conservation status are influenced greatly by the scale of the classificatory units chosen and the corollary that the wider the scale chosen the more likely that the results could be misleading.

Interestingly the International Biological Programme Survey did not discuss or debate the underlying objectives of their conservation proposals — should it be based upon species conservation, should it be community based, should it be ecosystem based or should it include abiotic or biotic elements? It claims to be based upon ecosystems (hence involving an amalgam of biotic and abiotic elements with an emphasis on interrelationships or systems) but jumps immediately to plant communities or alliances hence ignoring the abiotic environment. Perhaps the authors thought that debating and justifying their conservation rationale might introduce an

element of doubt in their evangelical statement. Or in reality was the rationale based upon that element for which data were most readily available?

Slatyer in a paper to a symposium in 1974 on the results of the International Biological Programme Survey refers to the absence of a specific basis for the conservation action proposed in the Specht Report and identifies two categories of reserve — "representative" reserves and "unique" reserves (Slatyer 1975).

According to Slatyer, "representative" reserves should be representative in terms of the range and characteristics of the habitats and communities that it is intended to conserve and to contain species populations which, because of their size and characteristics, possess a substantial fraction of the genetic variability present in the natural populations, and are likely to persist indefinitely. The category of "unique" reserves are those which possess some specific characteristics. They provide for additional special cases, not readily included in the representative reserves (Slatyer 1975).

Bases for Reserve Programmes

There is no doubt that national parks and nature reserves have a prime role in conservation. In the New South Wales context National Parks and Nature Reserves are reserve nomenclatures established by legislation with different but often overlapping and occasionally indistinguishable roles. For present purposes our attention is directed to the first two of IUCN's categories for conservation areas, namely Category I: Scientific Reserve/Strict Nature Reserve and Category II: National Park (IUCN CNPPA 1984) which are broadly referred to as nature conservation reserves and include those areas designated in New South Wales as National Parks and Nature Reserves.

The 10th General Assembly of the International Union for the Conservation of Nature (IUCN) held in New Delhi in 1969 defined a national park as follows:

"A National Park is a relatively large area where one or several ecosystems are not naturally altered by human exploitation and occupation, where plant and animal species, geomorphic sites and habitats are of special scientific, educative and recreative interest or which contain a natural landscape of great beauty" (Van Osten 1972).

This definition does not assist in deciding where in terms of scientific principles conservation effort should be directed.

In 1985 the New South Wales National Parks and Wildlife Service undertook a review of the basis of the organization's nature conservation programme

(Hitchcock 1985). It classified the nature conservation resource into categories. Six components of the Service's nature conservation programme were identified:

- Firstly, the biotic resources of plants and animals.
- Secondly, the abiotic resources consisting of geological sites, geomorphological sites, palaeontological sites, pedological sites, palynological sites.
- Thirdly, landscape components such as wilderness areas, wild and scenic rivers, natural scenic landscapes and natural phenomena.
- Fourthly, scientific components such as reference areas and experimental areas.
- Fifthly, educational areas.
- Sixthly, ecosystems of current importance, such as marine areas, wetlands, grasslands, rainforests.

Within the component of biotic resources of plants and animals are two elements:

- Firstly, genetic resources or genetic diversity which is comprised of the sum of species diversity plus genetic variation.
- Secondly, ecological resources or ecological diversity which is comprised of the sum of biological diversity plus bio-physical diversity.

Usually genetic diversity is considered in two aspects as it relates to rare and threatened species and non-threatened species (Hitchcock 1985).

Choices for a Reserve System

Where should the reserve programme head in the future? Hitchcock (1985) has identified the various components of a nature conservation programme. New South Wales has already achieved on the surface an impressive record in its reserve programme which can now boast responsibility for the management of 3.7 million hectares or 4.62% of the land surface of New South Wales, although such efforts have been confined almost exclusively to terrestrial environments while marine reserve establishment has not occurred largely as a result of inter-agency conflict with the fisheries management agency.

However, the identification of the components of a nature conservation programme needs to be accompanied by an assessment of which components are important, of ascribing priorities and making choices. Thereafter comes the task of building a sampling protocol for the chosen component(s) and designing a reserve system based on the results of the sampling

strategy. Within these consequential steps fall much of the recent advances in conservation biology, particularly in areas such as species/area ratios and the implications of island biogeographic theory, minimum viable populations, long term survival from stochastic events, and externalities and boundary design. But for such consequential steps to be rigorous they need to be soundly founded on an explicit statement of the conservation aim of what is to be conserved.

Many national park authorities including that in New South Wales have approached the question of reserve establishment as an area-based rather than a resource-based task. Thus an area has been examined and within it resources have been identified which are considered to merit conservation. This was the approach of the Scientific Committee on Parks and Reserves and has largely been followed since by the New South Wales National Parks and Wildlife Service. However, a more logical and objective basis for reserve establishment requires a reversal of this approach. In essence the resources of a nature conservation programme should be examined first and subsequently areas should be identified which will enable those resources to be conserved.

The assessment of which components of a nature conservation programme are important and the ascribing of priorities and the making of choices is predicated on two assumptions:

- Firstly that the assessment of the importance of a component will result in the elimination of those components of a nature conservation programme which are not considered to be a valid basis for a programme or are peripheral and incidental to such a programme based upon other components.
- Secondly that due to limitations of human and financial resources choices need to be made as to what a nature conservation programme can achieve and hence it is desirable that efforts be directed to a programme based upon such component(s) which will yield the maximum benefit for nature conservation.

In New South Wales, priorities for the resources components of the nature conservation programme need to be established, for in the future areas will be more expensive and competition will be greater. Much of the New South Wales National Parks and Wildlife Service's estate to date has been provided free of charge from the division or redistribution of government lands although the transferers have not always been willing agents in the embellishment of the national park system. Today there are few remaining large areas of unoccupied Crown lands and the prospects for significant further redistributions of government lands are slim as the utilization

patterns for most government held lands have been settled and government programmes are directed at maximizing the disposal of public lands. Given these circumstances land acquisition in the future will form an increasingly significant part of any programme of park expansion. Thus one may face the paradoxical situation where expenditure on land acquisition by the National Parks and Wildlife Service increases whilst the area of newly reserved lands may decrease. This is already evident — budget allocations for land acquisition by the New South Wales National Parks and Wildlife Service have increased from \$1.3 million in 1984/85 to \$3 million in 1986/87 to \$4.5 million in 1987/88 whilst the area of new reserves has declined. In 1989/90 budget allocations for land acquisition for the park system were reduced and the short-term prognosis is one of further reduction.

When you pay real money for areas you tend to be a little more careful that you really are getting what is not merely important or useful but what matters most. Hence the need for priorities in terms of what resource component provides the driving force for nature conservation programmes.

The model posed here is based upon a nature conservation agency explicitly and logically formulating a nature conservation programme from its initial objectives or bases through a sampling strategy to reserve design. The assumption that public policy decisions in nature conservation are made on logical scientific grounds by expert agencies is of course illusory. Aside from the role of internal organizational culture on a nature conservation agency, the process of reserve establishment involves a pluralistic decision making interaction between the political process, the nature conservation agencies, other competing resource management agencies, non-government conservation groups, development lobbies and public opinion. Often the dynamics of this interaction have meant that the nature conservation agency is neither the sole arbiter nor the principal driving force in the reserve establishment process. And the institutional arrangements applying in a state may preclude the nature conservation authority from that driving force role. This was the case in Victoria, Australia where reserve establishment was principally fashioned through the Land Conservation Council rather than the National Parks Service or in the case in the United States of America where Congress rather than the U.S. National Parks Service dominates in the reserve establishment process.

In New South Wales, while the institutional arrangements vest the National Parks and Wildlife Service with the formal driving force in reserve establishment (see section 8 of the National Parks and Wildlife Act 1974), it

may be argued that the driving force in reality lay elsewhere. For the first decade of the National Parks and Wildlife Service's existence, the Parks and Reserves Scientific Committee provided the essential blueprint for the reserve system modified at the margins by the National Parks and Wildlife Service's Resources Division. From the mid 1970s a series of themes developed by the non-government conservation movement dominated the dynamics of the reserve establishment process, from coastal parks (1976-1979), wilderness (1977-1980), rainforest (1977-1984), and back to wilderness (1985-1988). The success of the reserve expansion programme in New South Wales rested in no small measure on the interaction and co-operation between the National Parks and Wildlife Service and the non-government conservation movement. It demonstrated the importance of a reserve establishment programme flexible enough to take advantage of public interests and political fashion. Its disbenefit is that a reserve expansion programme fashioned on opportunism may at best contain gaps and distortions or at worst be misdirected with high opportunity costs and although brimming with aesthetic and emotional appeal, be fundamentally lacking in scientific logic.

Not that one should decry the efforts and enthusiasm of the non-government conservation groups. Rather the situation emphasizes the need for leadership and clear-thinking foresight by nature conservation agencies to provide scientific rigour which can form the basis of community activism.

In terms of priorities for the components of a nature conservation programme, while there is considerable emotional support for a nature conservation programme driven by landscape components, I doubt whether a programme so based can provide a reserve system which adequately samples natural resources. Rather the choices lie within the realm of the biotic resources, a choice between a nature conservation programme driven by genetic diversity or one driven by ecological diversity. Whichever choice is made the results in New South Wales in terms of area will be dramatically different. If the driving force is genetic diversity, then in terms of flora the principal area of attention will be on rare and threatened lowland rainforest species in the Tweed and Richmond Valleys. If the driving force is plant ecological diversity, then the principal area of attention will be the western slopes and plains of the State.

Hitchcock (1985) presented an over-view of plant associations poorly conserved within the reserve system at that date. This over-view utilized the alliances and associations identified by Beadle (1981) which to date forms the most comprehensive nation wide floristic classification. Beadle (1981) considered an association

as the basic unit of floristic classification with associations grouped in alliances. He defined the association as "a community in which the dominant stratum exhibits uniform floristic composition, the community usually exhibiting uniform structure". While assessment of the conservation status of alliances and associations within the reserve systems needs to be treated cautiously in view of a paucity of comparable inventories of existing reserves and areas outside reserves, this overview identified 21 plant associations as poorly conserved within the reserve system out of the approximately 500 plant associations found in New South Wales. These plant associations together with their location according to Anderson's (1961) Botanical Divisions and Subdivisions of New South Wales are as follows:

- **Castanospermum australe*–*Grevillea robusta* (Black bean-silky oak): North Coast.
- **Waterhausia floribunda*–*Tristanopsis laurina* (Weeping lilly-pilly–Water gum): North Coast.
- **Cadellia pentastylus* (Ooline scrub): North Western Slopes.
- **Planchonella cotinifolia* (Small leaved condoo): North Western Plains.
- **Eucalyptus maculata* "Alliance" (Spotted gum): North Coast, Central Coast, South West.
- **Eucalyptus melanophloia* and *E. melanophloia*–*Angophora floribunda* (Silver-leaved ironbark): North Western Plains, North Western Slopes, Northern Tablelands.
- **Eucalyptus populnea* "Alliance" (Poplar box): South Western Plains, Central Western Slopes, North Western Slopes, North Western Plains.
- **Eucalyptus albens* and *E. albens*–*Callitris columellaris* (White box and White box–White cypress pine): Tablelands Division and Western Slopes Division.
- **Eucalyptus moluccana* and *E. moluccana*–*E. tereticornis* (Grey box and Grey box–Forest red gum): Coastal Division, Northern Tablelands.
- **Eucalyptus melliodora*–*Callitris columellaris* (Yellow box–White cypress pine): South Western Plains.
- **Eucalyptus melliodora*–*E. blakleyi*: Southern Tablelands.
- **Eucalyptus viridis*–*E. polybractea*–*E. behrini* (Green mallee–Blue mallee–Bull mallee): South Western Plains.
- **Eucalyptus incrassata*–*E. socialis* (Lerp mallee–Pointed mallee): South Far Western Plains.
- **Eucalyptus dumosa* (Congoo mallee): Central Western Slopes.
- **Acacia harpophylla* "Alliance" (Brigalow): North Western Slopes and North Western Plains.
- **Acacia pendula* (Myall): Western Plains Division and Far Western Plains Division.

- **Acacia aneura* (Mulga): Far Western Plains Division and Western Plains Division.
- **Casuarina cristata*-*Heterodendrum oleifolium* (Belah-rosewood): Western Plains Division and Far Western Plains Division.
- **Atriplex nummularia* (Old man saltbush): Western Plains Division and Far Western Plains Division.
- **Eucalyptus microtheca* and *E. largiflorens* Associations (Coolibah-Black box): Far Western Plains Division and Western Plains Division.
- **Polygonum* spp., *Philydrum lanuginosum*, *Pseudoraphis spinescens* (Coastal freshwater wetlands): North Coast.

Of these 21 associations poorly conserved in the reserve system in New South Wales 15 are found west of the Great Dividing Range in the Western Slopes and Western Plains Divisions.

In terms of plant species conservation, Briggs and Leigh (1988) provide a nation wide over-view regarding rare and threatened plants. Endangered Species are considered to be those species in serious risk of disappearing from the wild state in one or two decades if present land use and other causal factors continue to operate; vulnerable species are those not presently endangered but at risk of disappearing from the wild over a longer period (20-50 years) through continued depletion, or which largely occur on sites likely to experience changes in land use that would threaten the survival of the species in the wild (Briggs and Leigh 1988). Of the Endangered Species present in New South Wales, 26 species or 35% of the total are located in the North Coast Subdivision, while of the Vulnerable Species 40 species or 18% of the total are located in the North Coast Subdivision (Briggs and Leigh 1988). Yet the entire Western Slopes Division, Western Plains Division and Far Western Plains Division contain 12 species classified as Endangered and 66 species classified as Vulnerable (Briggs and Leigh 1988).

The International Union for the Conservation of Nature and Natural Resources (IUCN) at a global level evaluates the adequacy of protected area coverage by reference to biomes and biogeographical provinces; however, it was noted that such a global overview is of limited value for individual nations in selecting reserves (MacKinnon, Child and Thorsell 1986). Nonetheless IUCN considers that subdivisions of biogeographic units should be used at a regional or national level.

In addressing the basis for reserve selection, IUCN however equivocates from one which is community based to one which is species based. Hence it states: "Species do not live in isolation, they live in communities and in ecosystems. It has become widely accepted that habitat protection is fundamental to save species so reserves should be selected on the basis of

representational coverage of habitat types. If this is done perfectly, most species' needs would be met, but in fact the degree of distinctions between habitat classification is neither consistent nor always adequate. It is often more practical to select protected areas on the basis of which key species they harbour; in any case, this method is a useful independent check on the biogeographical approach" (MacKinnon, Child and Thorsell 1986). Further, IUCN considers that the selection of reserves on the criteria of species presence is favoured for six reasons:

- It identifies areas which require urgent protection.
- Use of species criteria independently checks and complements the reserve coverage achieved by the biogeographic approach.
- Focussing on key species gives a good indication of the effectiveness of management.
- Species provide a focal point or objective that people can readily understand.
- Species have an appeal which wins sympathy, an important factor in raising public awareness and helping fund raising.
- Species lists for proposed protected areas provide hard data to back up the biogeographical approach.

The third, fourth and fifth reasons, while often of practical importance do not relate to objective criteria upon which to base a reserve system while the first and sixth reason could equally apply to a system which is community based rather than reserve based. The second reason assumes a basic congruity between the outcomes of both approaches, a valid assumption if one is faced by a *tabula rasa* but not necessarily and often not the case given the extent of human interference in the natural environment.

In the reviews of the protected areas system undertaken for IUCN in the Indo-Malayan and Afrotropical Realms, the approach taken focussed initially on the coverage of biogeographic units and then secondarily on general topics and species conservation (MacKinnon 1986a and 1986b).

The most cogent argument against a community based reserve system rests in the debate in ecology over the nature of the community and whether in fact such units exist (Whittaker 1975; Krebs 1985). Nonetheless experience has shown that communities, whilst not discrete or always consistent, can be classified for convenience. The advantages of a species based reserve system is that species are fundamental units of nature rather than artificial human constructs.

There can be no objective means of determining which approach is the best. However, the conservation of ecological diversity can be argued as deserving priority

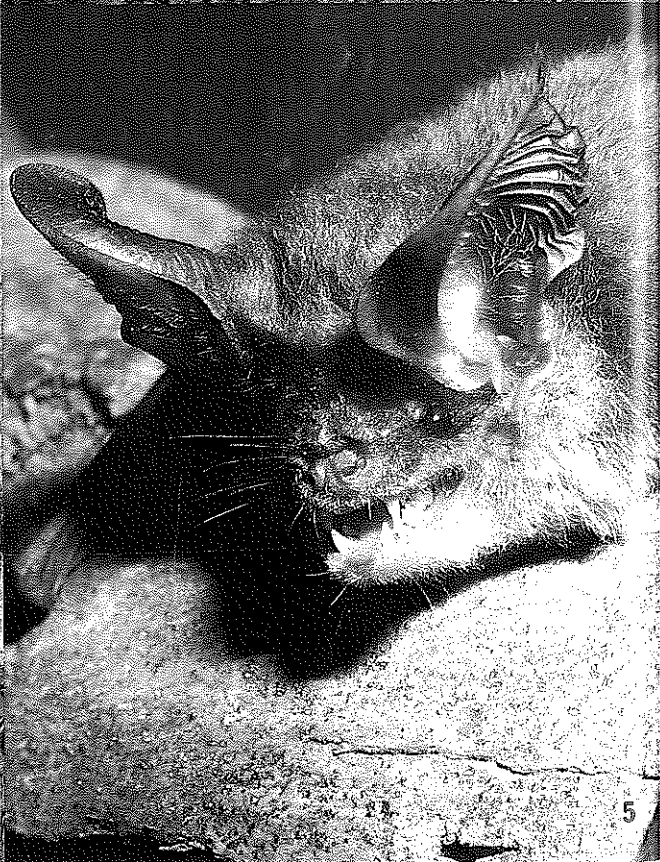




Figure 1. Fanning River (Photo by Les Hall). This crack leads to a maternity cave for Little bent-winged bats (*Miniopterus australis*) at Fanning River, Queensland. Its survival was threatened by limestone mining, but steps are now being taken to protect the site.



Figure 2. Pinevale Mine (Photo by Les Hall). Abandoned mines have provided bats with suitable roost sites all over Australia. Unfortunately many of the mines are collapsing or being re-worked. This old gold mine west of Mackay is home to four species of bats, but has commenced to cave in.

Figure 3. Conondale Mine (Photo by Queensland Forestry Department). This old gold mine in the Conondale Ranges, south-east Queensland has been gated and fenced to protect bats. Since the erection of the fence and gate by the Queensland Forestry Department, there has been a dramatic rise in the numbers of bats in the mine.

Figure 4. Pine Creek (Photo by Les Hall). Kohinoor mine, near Pine Creek in the Northern Territory contains the largest known colony of Ghost Bats (*Macroderma gigas*) in Australia. Mining activities in the area could destroy the mine.

Figures 5 and 6. *Nyctophilus gouldii* (Photos by Les Hall). This long-eared bat is an important indicator species for forestry management. It lives in tree-hollows and under bark and never moves far from its roost site. More studies are needed to understand the effects of fragmentation and selective logging on this species.

as the driving force for the nature conservation programme. This is based upon the fact that a programme giving priority to the conservation of ecological diversity is:

- The approach that will maximize the conservation return for the effort and funds invested.
- The approach that will result in products which will be most viable and enduring.
- The approach that will conserve simultaneously a range of other components.

In such an approach, plant associations and alliances are utilized as the components, the adequate sampling of which, forms the foundation of the reserve system. As a secondary priority the reserve system so constructed can be augmented to cover those aspects of species conservation plus conservation of abiotic resources, landscape components, scientific experimental components and educational areas not already covered. But given such a ranking of priorities for the basis of a reserve system, inevitably some of those resources of components of secondary importance will be lost as a cost and consequence of ascribing priority to a community based reserve system. Additionally further assessment is required of the adequacy of a reserve system fundamentally designed on flora to meet the requirements of fauna conservation which in the Australian context relies to a far greater extent on active management intervention than does flora conservation (Newsome 1973). Whether the concept of the community as developed in plant ecology has a similar meaning when applied to animal species is severely open to question. Given the predominance of population ecology as opposed to community ecology in the study of animals, the concept of the community in animal species is poorly developed.

Whether that choice is correct or not will only be shown with the effluxion of time. Certainly we must encourage debate on the objectives and priorities for conservation reserves. But debate should not be a substitute for action. Rather they need to go hand in hand. As Frankel and Soule (1981) wrote:

"Conservationists cannot afford the luxury and excitement of adversary science. The weakness of this parochial style of intellectual progress is that years or decades may pass before a clear resolution is reached and before timid technocrats or politicians decide that action will not bring a storm of criticism. By the turn of the century most options will be closed regarding the design, size and organization of nature reserves".

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Inland occurrences of the Yellow-footed Antechinus *Antechinus flavipes* (Waterhouse, 1838) in New South Wales

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INTRODUCTION

In August 1989 Mr D. Murray found the body of a male dasyurid on the plains adjacent to a channel on his property "Newfoundland", on the western bank of the Darling River 30°50'S, 144°45'E (Fig. 1). Not recognizing the animal, he forwarded it to the National Parks and Wildlife Service Office at Bourke where it was tentatively identified as the Yellow-footed Antechinus, *Antechinus flavipes*. There were no signs of injury to the animal so it was assumed that it had died as part of the male die-off in the antechinus. Since the animal was so far from the range described by Van Dyck (1983), the specimen was forwarded to head office for verification and to be lodged with the Australian Museum.

Much of "Newfoundland" is cracking clay floodplain. Sandstone ridges and footslopes occupy about one tenth of the property and support mulga woodland with some scattered eucalypt and cypress pine. This latter area is similar to the known habitat of *A. flavipes*.

Antechinus flavipes is recently recorded as an animal of woodland and forest areas along the Great Dividing Range and western slopes of New South Wales, thus restricting it to the eastern half of the state. The distribution maps by Van Dyck (1983) and by Triggs (1984) broadly agree on this, although they disagree on its occurrence in coastal areas (Fig. 1). Hampton *et al.* (1982) agree with Triggs, having only recorded